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FLOOD INSURANCE STUDY

PUTNAM COUNTY, OHIO
(UNINCORPORATED AREAS)

DECEMBER 5, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER · 390465

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

PUTNAM COUNTY,
UNINCORPORATED AREAS,
OHIO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Putnam County, Ohio, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the Ottawa River in the vicinity of the unincorporated community of Rimer were performed by the U.S. Army Corps of Engineers (COE), Buffalo District, (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-86-E-2226, Project Order No. 15. This study was completed in March 1987.

The hydrologic and hydraulic analyses for the Blanchard River and Riley Creek were performed by the U.S. Department of Agriculture, Soil Conservation Service (SCS), Ohio District. The analysis for the Blanchard River and Tawa Run in the vicinity of Ottawa was taken from the Flood Insurance Study for the Village of Ottawa (Reference 1).

1.3 Coordination

An initial coordination meeting was held on October 31, 1985, with representatives of the Putnam County Health Department, the Ohio Department of Natural Resources (ODNR), the Study Contractor, and FEMA to discuss the streams to be studied in detail.

A news article announcing intent to perform a Flood Insurance Study for Putnam County was published in the Putnam County Sentinel, Ottawa, Ohio. The announcement encouraged those with any relevant facts and technical data concerning local flood hazards to provide the information to the Putnam County Sanitation Department. They, in turn, forwarded any pertinent information to the Study Contractor.

Also, the COE sent letters to the SCS, U.S. Geological Survey (USGS) Water Resources Division, ODNR and the Putnam County Sanitation Department requesting technical data that would be useful in preparing the Flood Insurance Study for Putnam County.

On September 15, 1989, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Putnam County, Ohio. The area of study is shown on the Vicinity Map (Figure 1). The incorporated areas within the county were excluded from this study.

Flooding caused by overflow of the Blanchard River, the Ottawa River, Riley Creek, and Tawa Run was studied in detail.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Map for Putnam County, Ohio (Reference 2) and are incorporated into this Flood Insurance Study.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through March 1992. The scope and methods of study were proposed to and agreed upon by FEMA and Putnam County.

2.2 Community Description

Putnam County is located in northwestern Ohio and has a total land area of 480 square miles. It is bordered by Paulding and Van Wert Counties on the west, Allen County on the south, Hancock County on the east, and Henry and Defiance Counties on the north. Putnam County is served by U.S. Route 224, State Routes 12, 15, 65, 66, 108, 109, 114, 115, 189, 190, 613, 634, 694, and 696, the CSX railroad, Grand Trunk Western Railroad, and the Norfolk Southern Railway. The 1980 population of Putnam County was reported to be 32,991 (Reference 3).

Putnam County is influenced by a climate which is continental in nature. This is characterized by moderate extremes of temperature and precipitation. The maximum temperature at the nearest climatological data station of 101 degrees Fahrenheit (^{o}F) was recorded in August 1951, and a

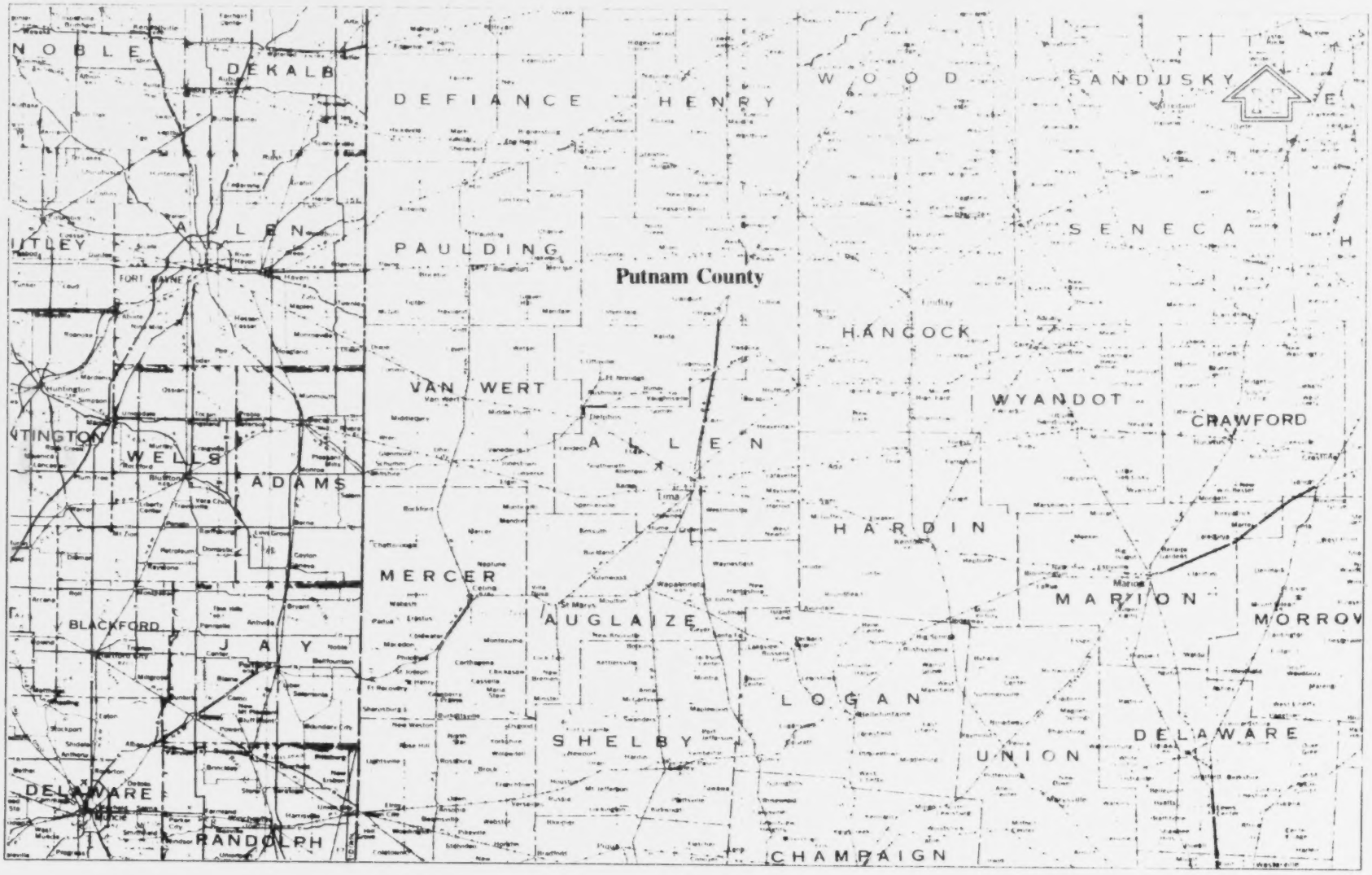


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

16 0 16 32 48 MILES

VICINITY MAP

minimum of -19°F was recorded in January 1963. The maximum 24-hour rainfall is 3.65 inches recorded on September 17, 1969, and the maximum 24-hour snowfall was 19.0 inches, recorded on January 14, 1964 (Reference 4).

2.3 Principal Flood Problems

Most floods in Ohio are caused by rainfall of unusually high intensity and duration. Severe thunderstorms cause local flash flooding. General flooding occurs most frequently during January to March and occasionally during August or October (Reference 4).

A flood which occurred in March 1913 is the most severe flood of record. The majority of the damage occurred in and around the Village of Ottawa. The 1913 flood was estimated to have a recurrence interval of more than 1,000 years (Reference 5). In the same vicinity, two serious floods occurred in 1959 within a period of 20 days. An extremely low temperature was experienced in a January flood, and this resulted in the ponded floodwaters freezing at their peak stage. Many roads were impassable for several days after the flood subsided due to the accumulation of ice. The second flood occurred in February and caused approximately $705,000 worth of damage. The estimated recurrence intervals for the January and February floods of 1959 are 9 and 34 years, respectively (Reference 1).

These same floods caused overbank flooding along the Ottawa River, near the unincorporated community of Rimer. The gage station located at Allentown, upstream of Rimer, measured a peak discharge of 7,740 cubic feet per second (cfs). The estimated recurrence interval for these floods at Rimer is 50 years.

Another serious flood occurred in June 1981 causing major damage in Ottawa and adjacent rural areas. At the USGS gaging station near Findlay, this flood exceeded the February 1959 flood by two-thirds of a foot for an all time high at the gage. The corresponding peak discharge was estimated to have a recurrence interval of 50 years (Reference 1). For this same flood, in the Rimer area, the gage station at Allentown measured a peak discharge of 5,860 cfs. The estimated recurrence interval for this flood at Rimer is 13 years.

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the

recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40-percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60-percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

The 100-year discharge for the Ottawa River in the study area was calculated using the 100-year discharge at the gage on the Ottawa River at Allentown, and the Bulletin No. 45 guidelines for ungaged sites on gaged streams (Reference 6).

The flood discharges for the Blanchard River and Riley Creek were established using the TR-20 computer program (Reference 7). This version of TR-20 uses the modified Attenuation-Kinematic procedure of stream and valley flood routing.

To develop discharge-frequency relationships for the Blanchard River at Ottawa, data from the discontinued USGS gage (No. 04189500) near Ottawa were correlated with information from the USGS gage (No. 04189000) near Findlay, Ohio. Gage No. 04189500 was located at the Township Road 229 Bridge over the Blanchard River, approximately 1.5 miles northwest of Ottawa, and was in operation during the years 1922 to 1928 and 1947 to 1951. Gage No. 04189000 is located 2 miles west of Findlay or approximately 16 miles upstream of Ottawa. It has been in continuous operation since 1924 except for the years 1937 to 1940.

A log-Pearson Type III analysis was performed on the two-station data using procedures of Appendix 7, Bulletin No. 17B (Reference 8). The procedure involves adjusting the log-Pearson Type III statistics at the short-term station (Glandorf) using the statistics at a long-term station (Findlay) and regression and correlation coefficients derived from concurrent flow record of the two stations.

Tawa Run is an ungaged stream with a 4.1 square mile drainage area. The USGS gage (No. 04189100) on Tiderishi Creek near Jeneria, Hancock County, has a 4.35 square mile drainage area. The Tiderishi gage data were used in determining the discharge-frequency relationship for Tawa Run using Bulletin No. 17B (Reference 8).

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods for each flooding source studied in detail in the community area are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BLANCHARD RIVER					
about 1.25 miles above the mouth	N/A	15,700	20,700	23,200	27,800
about 0.8 mile upstream of County Route 19	N/A	15,900	20,800	23,300	27,900
about 0.7 mile downstream of County Route 15	N/A	15,600	20,500	23,000	27,600
just downstream of County Route 15	N/A	15,400	20,300	22,800	27,400
about 3.76 miles upstream of County Route 15	N/A	13,400	17,800	19,900	24,000
about 5.14 miles upstream of County Route 15	N/A	13,300	17,700	19,800	24,000
about 1.22 miles downstream of confluence of Tawa Run	638	13,100	18,200	20,700	26,500
about 0.8 mile downstream of State Route 696	N/A	9,600	13,200	14,300	16,900
about 0.5 mile upstream of County Route 5	N/A	9,500	13,200	14,200	16,800
OTTAWA RIVER					
about 2,000 feet downstream of State Route 189	217	N/A	N/A	9,300	N/A
RILEY CREEK					
about 2,200 feet above mouth	N/A	5,400	7,100	8,200	10,400
about 2,800 feet downstream of State Route 696	N/A	5,300	7,000	8,200	10,500

TABLE 1 - SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
TAWA RUN					
at mouth	4.1	375	490	535	620
about 0.9 mile above mouth	3.7	345	440	475	550
about 1.9 miles above mouth	1.5	175	220	240	275

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data for the streams studied were obtained by field survey, topographic maps (Reference 9), and aerial photography and photogrammetry (Reference 10). Bridges were surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Roughness coefficients (Manning's "n") and contraction and expansion loss coefficients used in the hydraulic computations were chosen using the Guide for Selecting Roughness Coefficient "n" Values for Channels (Reference 11), engineering judgment, and based on field observations of the streams and floodplain areas.

For the Ottawa River, the Manning's "n" values ranged from 0.030 to 0.045 for channel sections and from 0.06 to 0.07 for overbank conditions. The contraction and expansion loss coefficients for the Ottawa River were 0.2 to 0.4 and 0.4 to 0.6, respectively.

For the Blanchard River, the Manning's "n" values ranged from 0.026 to 0.063 for channel sections and from 0.041 to 0.187 for overbank conditions. For Riley Creek, the Manning's "n" values ranged from 0.042 to 0.057 for channel sections and from 0.070 to 0.168 for overbank conditions. For Tawa Run, the Manning's "n" values ranged from 0.012 to 0.035 for the channel and from 0.013 to 0.06 for overbank conditions.

For the Ottawa River, Blanchard River (in the vicinity of Ottawa), and Tawa Run, water-surface profiles were developed using the HEC-2 step-backwater computer program (Reference 12).

Starting water-surface elevations for the Ottawa River were determined using normal depth calculations. Starting water-surface elevations for the

Blanchard River, in the vicinity of Ottawa, and Tawa Run were calculated using Manning's equation and the continuity equation.

Water-surface elevations for the remaining areas of the Blanchard River and for Riley Creek were developed using the WSP-2 step-backwater computer program (Reference 13).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been shown.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross-sections, the boundaries for the Blanchard River, in the vicinity of Ottawa, the Ottawa River, and Tawa Run were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 5 feet (Reference 9). The boundaries in the remaining areas of the Blanchard River and Riley Creek were delineated on topographic maps (Reference 9) and transposed to aerial photomosaics using the width of the floodplain and floodway at each surveyed cross section and interpolating along contours between cross sections. The photomosaics were made from aerial photos supplied by USDA, Agricultural Stabilization and Conservation Service (ASCS).

The 100-year and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary

corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Map for Putnam County (Reference 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways for this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway for the Blanchard River and Riley Creek lie within areas not included.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
BLANCHARD RIVER								
A	1.25	864	10,548	2.2	714.0	714.0	715.0	1.0
B	1.62	577	7983	2.9	714.2	714.2	715.2	1.0
C	2.26	919	11,009	2.1	714.6	714.6	715.6	1.0
D	2.45	757	8918	2.6	714.7	714.7	715.7	1.0
E	2.49	314	5257	4.4	714.8	714.8	715.8	1.0
F	2.70	815	11,108	2.1	715.0	715.0	716.0	1.0
G	3.05	1281	16,617	1.4	715.2	715.2	716.2	1.0
H	3.81	1012	12,864	1.8	715.6	715.6	716.6	1.0
I	4.15	560	7400	3.1	716.0	716.0	717.0	1.0
J	4.73	927	12,093	1.9	716.5	716.5	717.5	1.0
K	5.10	1099	14,941	1.6	716.6	716.6	717.6	1.0
L	5.32	904	11,645	2.0	716.8	716.8	717.8	1.0
M	5.57	515	8037	2.9	716.9	716.9	717.9	1.0
N	6.10	778	10,177	2.3	717.3	717.3	718.3	1.0
O	6.44	428	7098	3.3	717.6	717.6	718.6	1.0
P	6.47	381	6386	3.6	717.9	717.9	718.9	1.0
Q	6.75	680	11,062	2.1	718.2	718.2	719.2	1.0
R	7.21	872	11,282	2.1	718.4	718.4	719.4	1.0
S	7.71	559	8577	2.7	718.8	718.8	719.8	1.0
T	8.19	1160	16,902	1.4	719.0	719.0	720.0	1.0
U	8.61	664	10,503	2.2	719.2	719.2	720.2	1.0
V	8.64	521	9187	2.5	719.8	719.8	720.8	1.0
W	8.94	723	10,980	2.1	719.9	719.9	720.9	1.0
X	9.28	980	12,869	1.8	720.1	720.1	721.1	1.0
Y	9.74	802	11,175	2.1	720.3	720.3	721.3	1.0
Z	10.12	969	13,504	1.7	720.4	720.4	721.4	1.0

[1]MILES ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

BLANCHARD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
BLANCHARD RIVER								
AA	10.45	975	12,966	1.8	720.5	720.5	721.5	1.0
AB	11.01	1541	18,841	1.2	720.7	720.7	721.7	1.0
AC	11.59	747	9369	2.5	720.9	720.9	721.9	1.0
AD	12.00	882	11,261	2.0	721.2	721.2	722.2	1.0
AE	12.47	1355	17,644	1.3	721.4	721.4	722.4	1.0
AF	12.71	916	11,258	2.0	721.4	721.4	722.4	1.0
AG	12.75	824	10,226	2.2	721.7	721.7	722.7	1.0
AH	13.02	601	8491	2.7	721.9	721.9	722.9	1.0
AI	13.47	1520	19,329	1.2	722.1	722.1	723.1	1.0
AJ	14.39	709	9404	2.4	722.4	722.4	723.4	1.0
AK	14.72	488	7931	2.9	722.6	722.6	723.6	1.0
AL	15.08	703	9572	2.4	722.9	722.9	723.9	1.0
AM	15.78	1423	18,129	1.3	723.1	723.1	724.1	1.0
AN	16.28	720	9931	2.3	723.3	723.3	724.3	1.0
AO	16.49	1083	14,108	1.4	723.4	723.4	724.4	1.0
AP	17.00	413	6551	3.0	723.6	723.6	724.6	1.0
AQ	17.28	1131	12,189	1.6	723.9	723.9	724.9	1.0
AR	17.87	706	9508	2.1	724.1	724.1	725.1	1.0
AS	18.25	334	5621	3.5	724.3	724.3	725.3	1.0
AT	21.02	1065[2]	12,903	1.6	725.5	725.5	726.3	0.8
AU	21.42	1793[2]	17,226	1.2	725.7	725.7	726.5	0.8
AV	22.35	1128[2]	16,245	1.3	726.0	726.0	726.8	0.8
AW	22.47	1345[2]	12,874	1.6	726.1	726.1	726.9	0.8
AX	24.21	1050[2]	12,797	1.6	729.4	729.4	730.2	0.8
AY	25.00	1223[2]	15,149	1.4	730.0	730.0	730.8	0.8
AZ	25.23	590[2]	9139	2.3	730.1	730.1	730.9	0.8

[1]MILES ABOVE MOUTH
[2]THIS WIDTH EXTENDS WITHIN AREA NOT INCLUDED

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

BLANCHARD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
BLANCHARD RIVER								
BA	25.39	669	11,029	1.9	730.7	730.7	731.5	0.8
BB	25.80	1006	12,064	1.7	731.2	731.2	732.0	0.8
BC	27.13	631	9007	2.3	732.0	732.0	732.9	0.9
BD	27.22	710	10,343	2.0	732.2	732.2	733.1	0.9
BE	27.53	580	7633	2.59	732.2	732.2	733.2	1.0
BF	27.57	827	8928	2.22	732.7	732.7	733.7	1.0
BG	27.80	748	10,436	1.90	732.9	732.9	733.9	1.0
BH	28.27	2271	32,803	0.60	733.0	733.0	734.0	1.0
BI	28.69	860	11,981	1.65	733.3	733.3	734.3	1.0
BJ	29.34	965	10,180	1.40	733.7	733.7	734.7	1.0
BK	29.74	1212	8072	1.77	734.1	734.1	735.1	1.0
BL	30.09	366	5063	2.82	734.6	734.6	735.6	1.0
BM	30.13	308	4042	3.54	734.9	734.9	735.9	1.0
BN	30.48	1107	8026	1.78	735.3	735.3	736.3	1.0
BO	30.80	950	6880	2.08	735.8	735.8	736.8	1.0
BP	31.23	345	4067	3.52	737.3	737.3	738.3	1.0
BQ	31.27	490	6130	2.33	738.2	738.2	739.2	1.0
BR	31.78	552	4326	3.28	738.7	738.7	739.7	1.0
BS	32.14	512	5362	2.65	739.6	739.6	740.6	1.0
BT	32.54	557	5683	2.50	740.2	740.2	741.2	1.0
BU	33.13	441	3012	4.71	741.7	741.7	742.7	1.0
BV	33.27	238	2632	5.39	742.0	742.0	743.0	1.0
BW	33.47	478	4924	2.88	742.4	742.4	743.4	1.0
BX	33.50	483	5355	2.65	743.2	743.2	744.2	1.0
BY	33.73	356	2978	4.77	743.6	743.6	744.6	1.0
BZ	34.15	372	4665	3.04	744.3	744.3	745.3	1.0

[1]MILES ABOVE MOUTH
[2]THIS WIDTH EXTENDS WITHIN AREA NOT INCLUDED

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

BLANCHARD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
BLANCHARD RIVER								
CA	34.51	810	4894	2.90	744.9	744.9	745.9	1.0
CB	35.13	887	5405	2.63	746.2	746.2	747.2	1.0
CC	35.61	787	4766	2.98	747.2	747.2	748.2	1.0
CD	35.98	626	4696	3.02	747.9	747.9	748.9	1.0
CE	36.37	1441	10,176	1.40	748.4	748.4	749.4	1.0
OTTAWA RIVER								
A	2000[2]	218	1254	7.4	748.0	748.0	748.6	0.6
B	2800[2]	210	1451	6.4	751.1	751.1	751.5	0.4
C	3850[2]	156	1106	8.4	752.4	752.4	752.7	0.3
D	5600[2]	180	1493	6.2	757.8	757.8	758.1	0.3
E	6400[2]	210	1998	4.7	758.7	758.7	759.7	1.0

[1]MILES ABOVE MOUTH
[2]FEET ABOVE CONFLUENCE OF LEATHERWOOD DITCH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

BLANCHARD RIVER—OTTAWA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, GA.
(UNINCORPORATED AREAS)

FLOODWAY DATA

RILEY CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
RILEY CREEK								
AA	6.97	249[2]	1826	4.5	767.6	767.6	768.6	1.0
AB	7.25	301	2268	3.6	769.1	769.1	770.1	1.0
AC	7.29	401	2494	3.3	769.6	769.6	770.6	1.0
AD	7.57	239	1465	5.6	772.8	772.8	773.8	1.0
AE	7.72	509	2692	3.1	773.7	773.7	774.7	1.0
AF	8.28	640	2752	3.0	778.7	778.7	779.7	1.0
AG	8.62	705	2560	3.2	782.0	782.0	783.0	1.0
AH	8.80	683	3356	2.4	782.9	782.9	783.9	1.0

[1]MILES ABOVE MOUTH
[2]THIS WIDTH EXTENDS WITHIN AREA NOT INCLUDED

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS

FLOODWAY DATA

RILEY CREEK

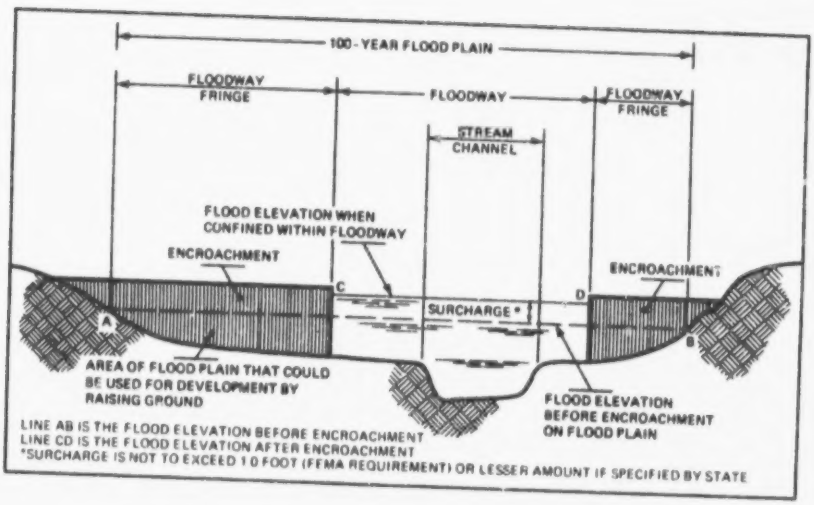

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
A
B
SURCHARGE *
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

Flood Insurance Studies for the Villages of Ottawa and Pandora, Ohio have been published (References 1 and 14). The SCS - Ohio District has recently completed a reanalysis of the Blanchard River and Riley Creek (Reference 10). Based on this report, the water-surface elevations for the Blanchard River within Putnam County are in agreement with the Flood Insurance Study for the Village of Ottawa. However, based on the new profile for the Blanchard River, the river mile stationing is off-set by approximately 1.0 mile. Therefore, the Village of Ottawa Flood Insurance Study water-surface profiles for the Blanchard River should be adjusted by adding 1.0 mile to the profile stationing. Also, this SCS report supersedes the hydrologic and hydraulic data for Riley Creek within the vicinity of the Village of Pandora. Therefore, the Flood Insurance Study for Pandora is not in agreement with this study. A revision to the Flood Insurance Study for the Village of Pandora may be performed in the future.

The Flood Insurance Rate Maps printed for Van Wert County, Ohio and the Villages of Fort Jennings, Kalida, and Ottoville, Ohio (References 15-18) are in agreement with this study.

The Flood Insurance Studies in progress for Allen, Defiance, Hancock, and Paulding Counties, Ohio (References 19-22) are in agreement with this study.

A Flood Insurance Rate Map has been printed for the Village of Glandorf, Ohio (Reference 23). The hydrologic and hydraulic data for the Blanchard River used in the Putnam County Flood Insurance Study was not available when the Glandorf study was prepared; hence, these two studies are not in exact agreement.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for Putnam County, Ohio (Reference 2).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 175 West Jackson Boulevard, 4th Floor, Chicago, Illinois 60604-2698.

Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the map repository of flood hazard data located in the community.

9.0 REFERENCES AND BIBLIOGRAPHY

1. Federal Emergency Management Agency, Flood Insurance Study, Village of Ottawa, Putnam County, Ohio, January 1986.

2. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Putnam County, Unincorporated Areas, Ohio, August 1977.

3. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Ohio, Washington, D.C., February 1982.

4. ————, National Oceanic and Atmospheric Administration, Climates of the States, 1974.

5. U.S. Army Corps of Engineers, Maumee River Basin, Indiana and Ohio, Interim Survey Report on Flood Control at Ottawa, Ohio, 1964.

6. State of Ohio, Department of Natural Resources, Division of Water, Bulletin No. 45, Floods in Ohio, Magnitude and Frequency, Columbus, Ohio, May 1977.

7. U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Technical Release No. 20, Computer Program for Project Formulation, Hydrology, May 1965, updated May 1982.

8. U.S. Department of the Interior, Geological Survey, Interagency Advisory Committee on Water Data, Office of Water Data Coordination, Hydrology Subcommittee, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency, September 1981, revised March 1982.

9. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 5 Feet: Bluffton, Ohio, 1960, photorevised 1973; Continental, Ohio, 1960, photorevised 1973; Kalida, Ohio, 1960, photorevised 1973; Leipsic, Ohio, 1960, photorevised 1973; Miller City, Ohio, 1960, photorevised 1973; Ottawa, Ohio, 1960, photorevised 1973.

10. U.S. Department of Agriculture, Soil Conservation Service, Flood Plain Management Study: The Blanchard River and Riley Creek, Allen, Putnam, Hancock, and Hardin Counties, Ohio, December 1987, corrected August 1988.

11. ----------, Soil Conservation Service, Guide for Selecting Roughness Coefficients "n" Values for Channels, Guy B. Fasken, December 1963.

12. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Computer Program 723-X6-L202A, Davis, California, April 1984.

13. U.S. Department of Agriculture, Soil Conservation Service, Technical Release No. 61, WSP-2 Computer Program, May 1976.

14. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Village of Pandora, Putnam County, Ohio, November 1978.

15. Federal Emergency Management Agency, Flood Insurance Rate Map, Van Wert County, Unincorporated Areas, Ohio, September 1987.

16. ————, Flood Insurance Rate Map, Village of Fort Jennings, Putnam County, Ohio, March 1984.

17. ————, Flood Insurance Rate Map, Village of Kalida, Putnam County, Ohio, October 1984.

18. ————, Flood Insurance Rate Map, Village of Ottoville, Putnam County, Ohio, August 1987.

19. ————, Flood Insurance Study, Allen County, Unincorporated Areas, Ohio, in progress.

20. ————, Flood Insurance Study, Defiance County, Unincorporated Areas, Ohio, in progress.

21. ————, Flood Insurance Study, Hancock County, Unincorporated Areas, Ohio, in progress.

22. ————, Flood Insurance Study, Paulding County, Unincorporated Areas, Ohio, in progress.

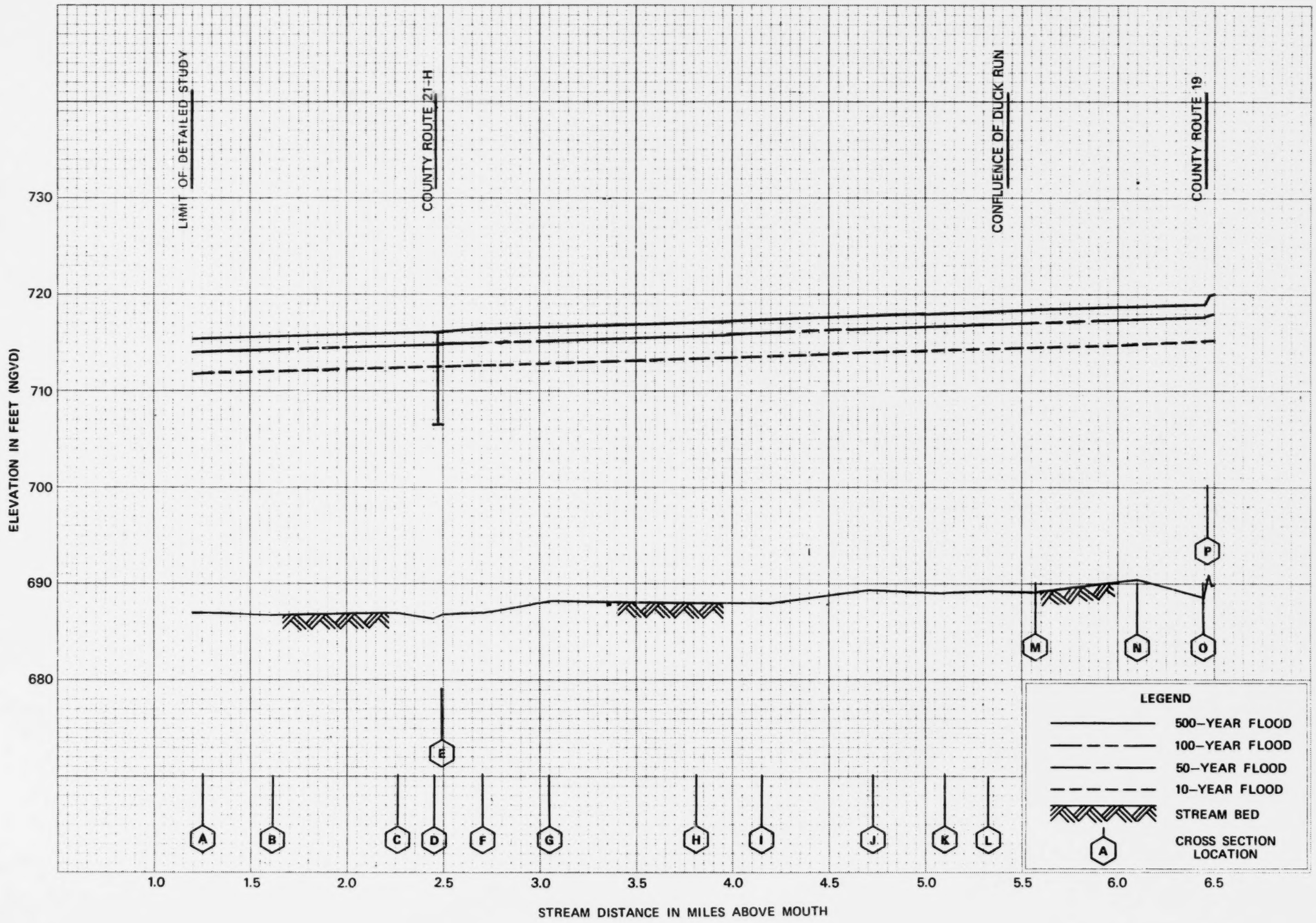
23. ————, Flood Insurance Rate Map, Village of Glandorf, Putnam County, Ohio, March 1984.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0015	717.17	chiseled square located at southwest corner of intersection of Township Road I-18 and County Route 21-H
2	0015	722.45	chiseled square located at west end of northwest abutment of County Route 19 bridge over the Blanchard River
3	0020	722.20	chiseled square located at southeast corner of southeast abutment of State Route 115 bridge over the Blanchard River
4	0020	720.63	chiseled square located at east end of south pier of County Route 15 bridge over the Blanchard River
5	0105	734.35	chiseled square located at northeast corner of north abutment of County Route 8 bridge over the Blanchard River
6	0105	740.06	chiseled cross located on northwest wingwall of Township Road M bridge over Riley Creek
7	0110	734.29	chiseled square located at southeast corner of southeast abutment of County Route 6 bridge over the Blanchard River
8	0110	738.89	chiseled square located at northeast corner of County Route 5 bridge over the Blanchard River
9	0120	771.76	chiseled cross located on northeast wingwall of Township Road Q bridge over Riley Creek
10	0135	759.82	chiseled cross located at northwest corner of southwest abutment of State Route 189 bridge over the Ottawa River

ELEVATION REFERENCE MARKS (Continued)

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
11	0135	761.94	standard table stamped "9 ADP 1959 762" in center of abandoned concrete headwall along County Route 18-S at intersection of Township Road U-13



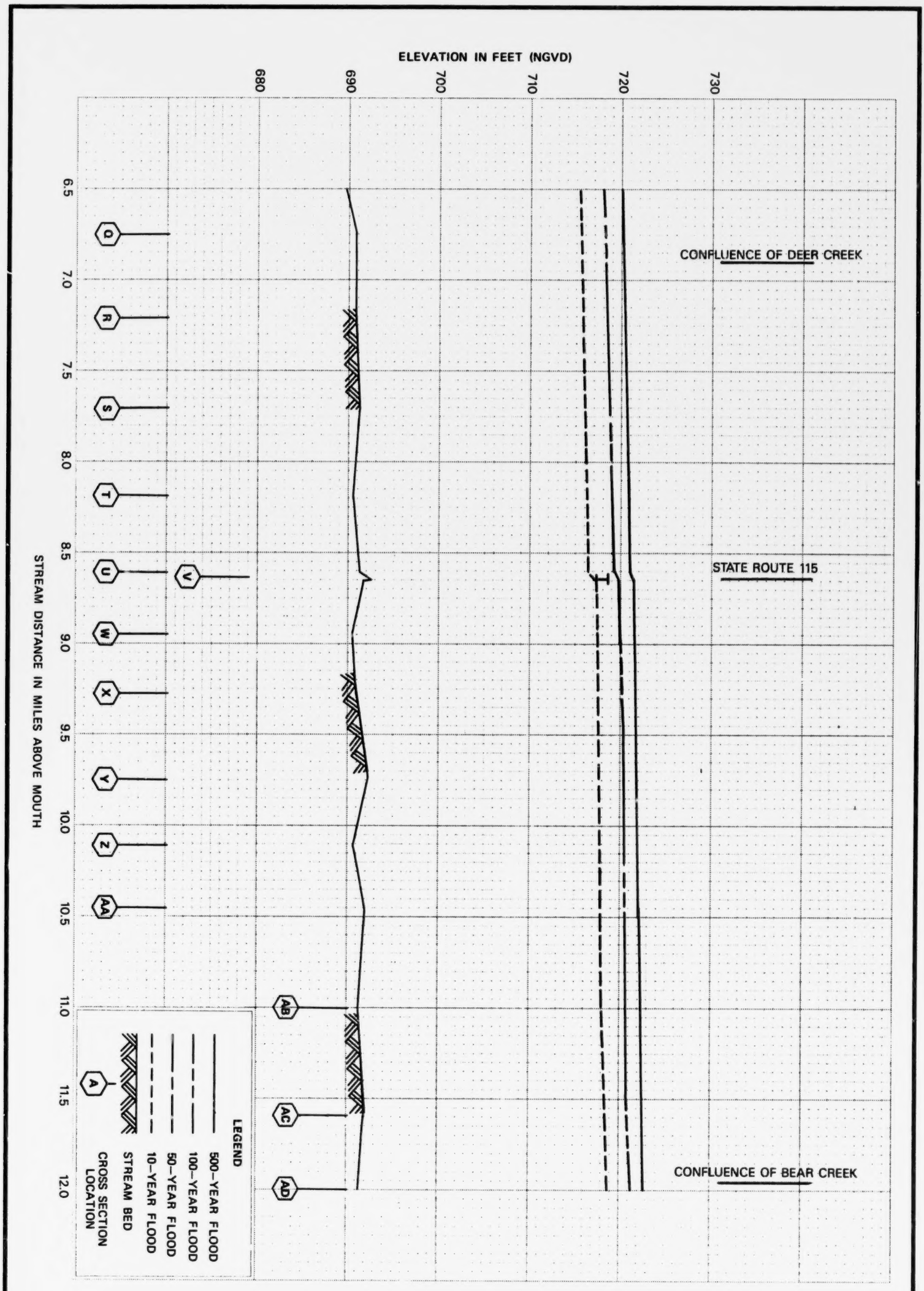
FLOOD PROFILES

BLANCHARD RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

01P



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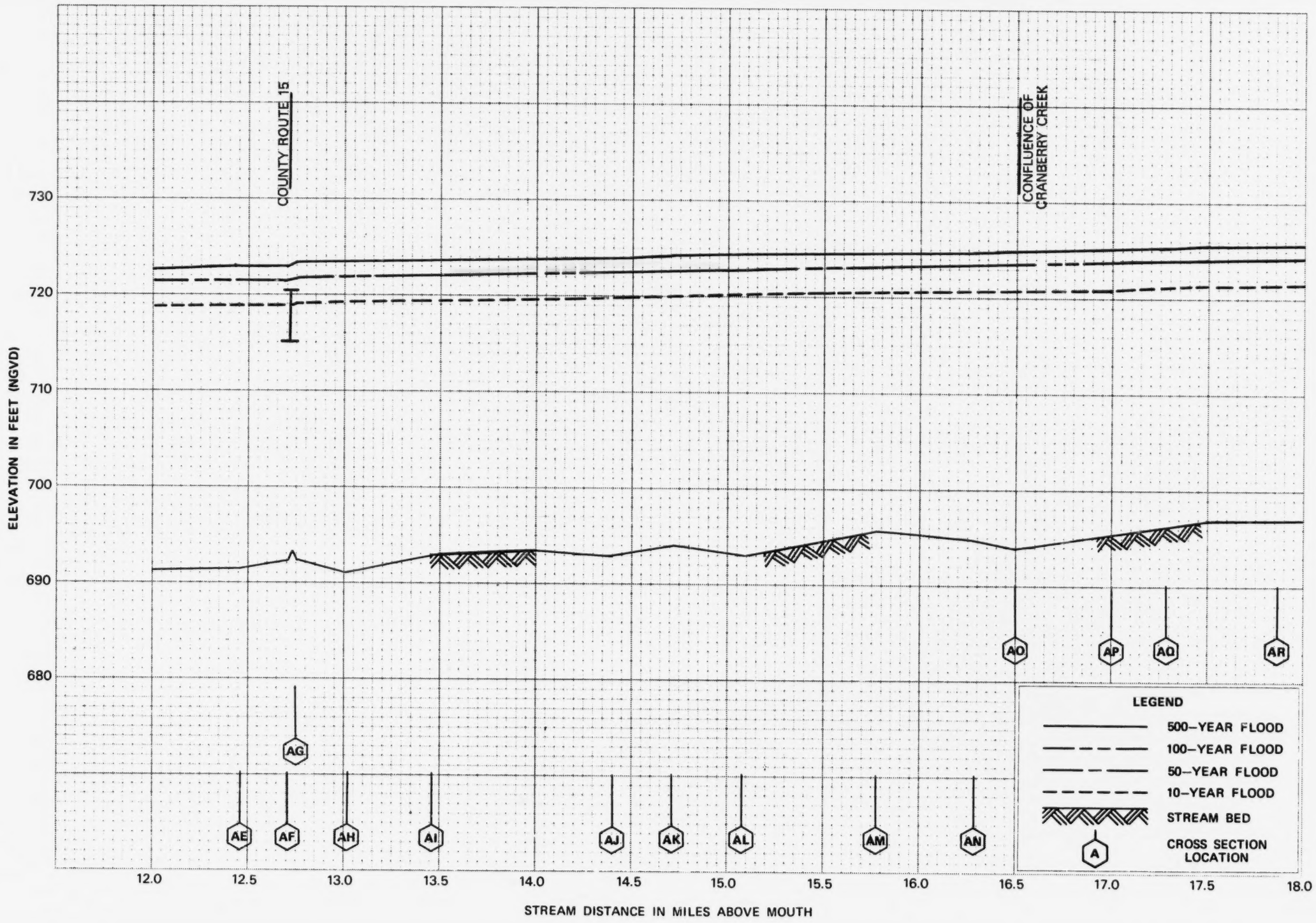


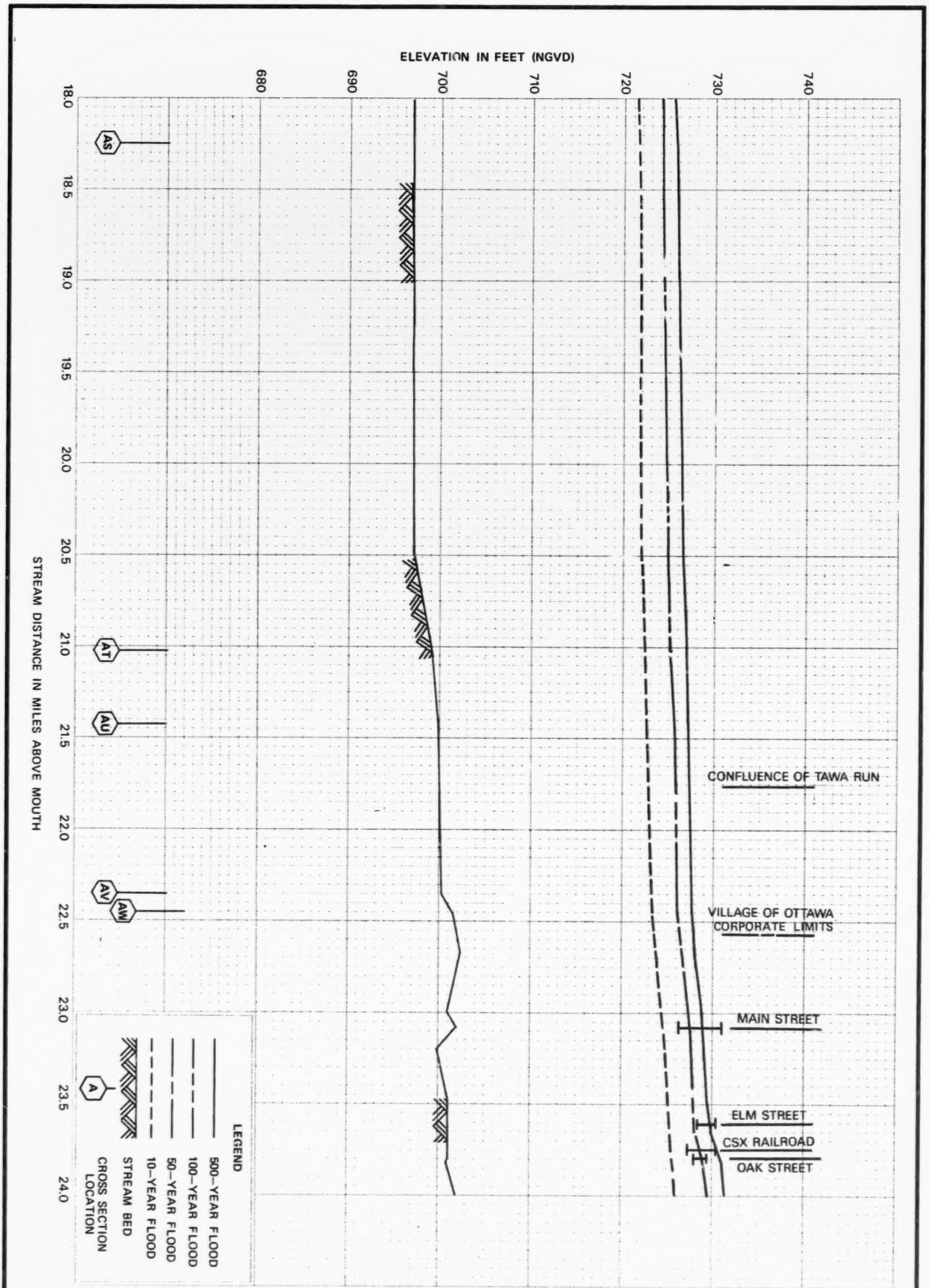
FLOOD PROFILES

BLANCHARD RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

03P



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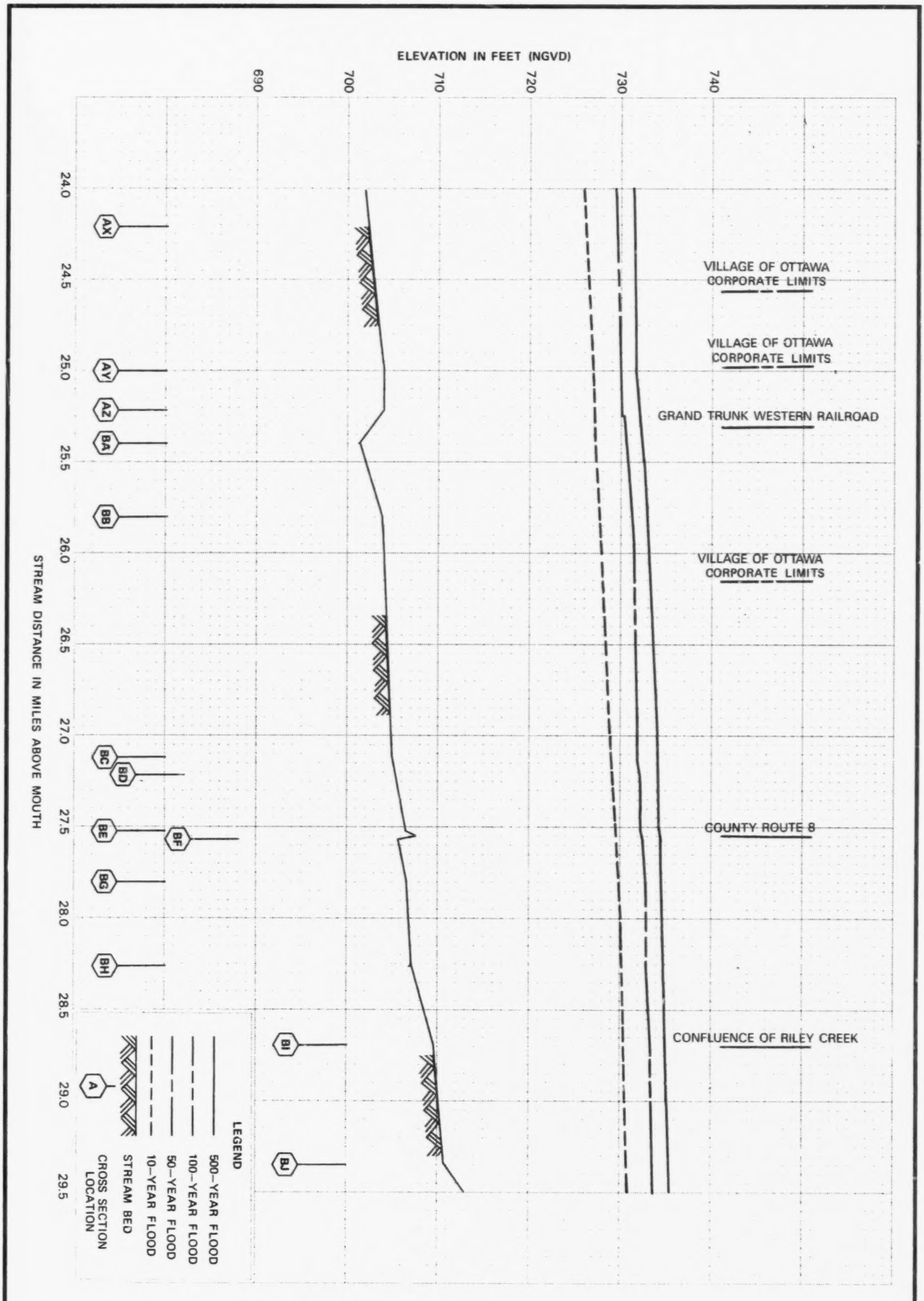
FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

BLANCHARD RIVER



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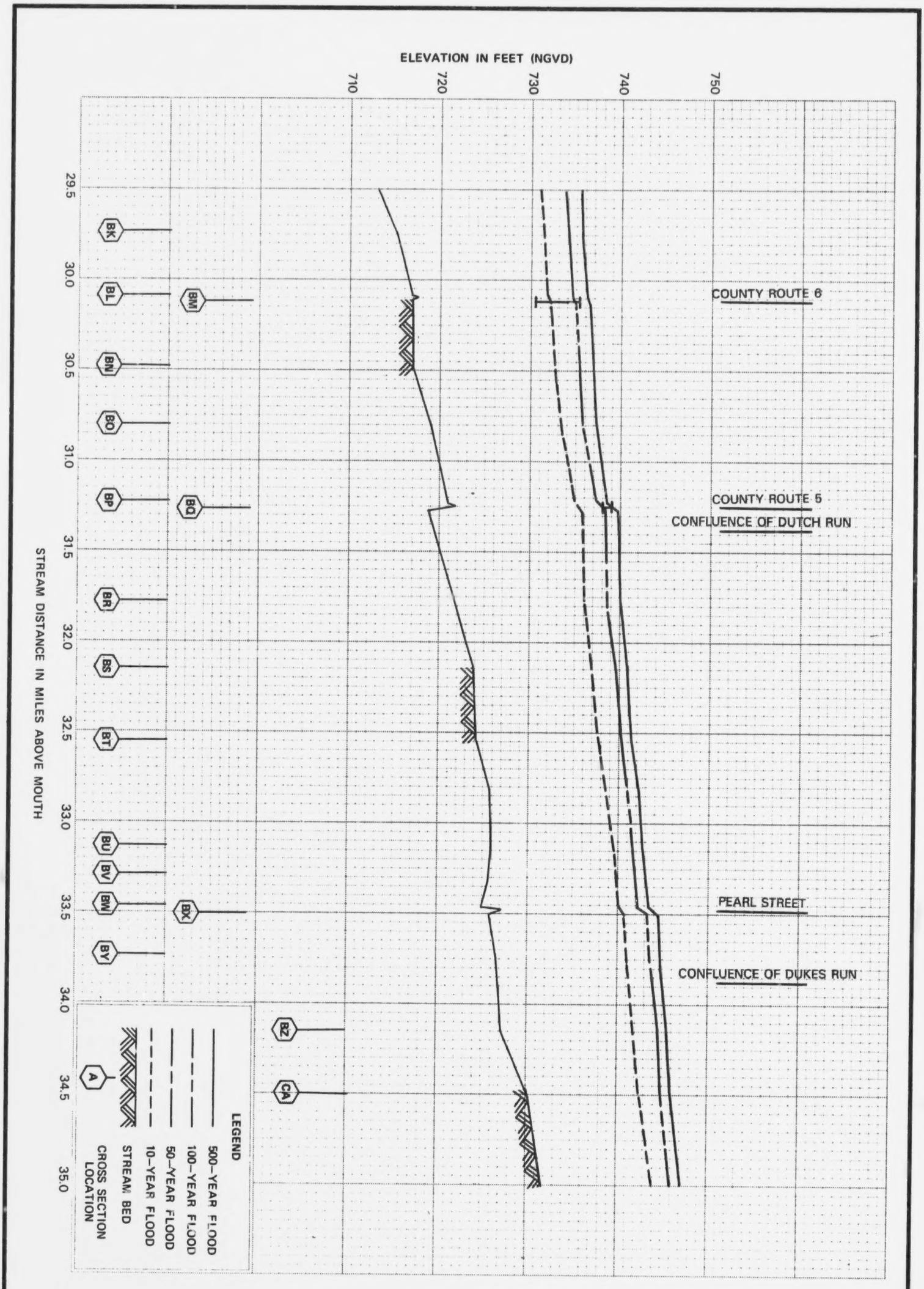
FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

BLANCHARD RIVER



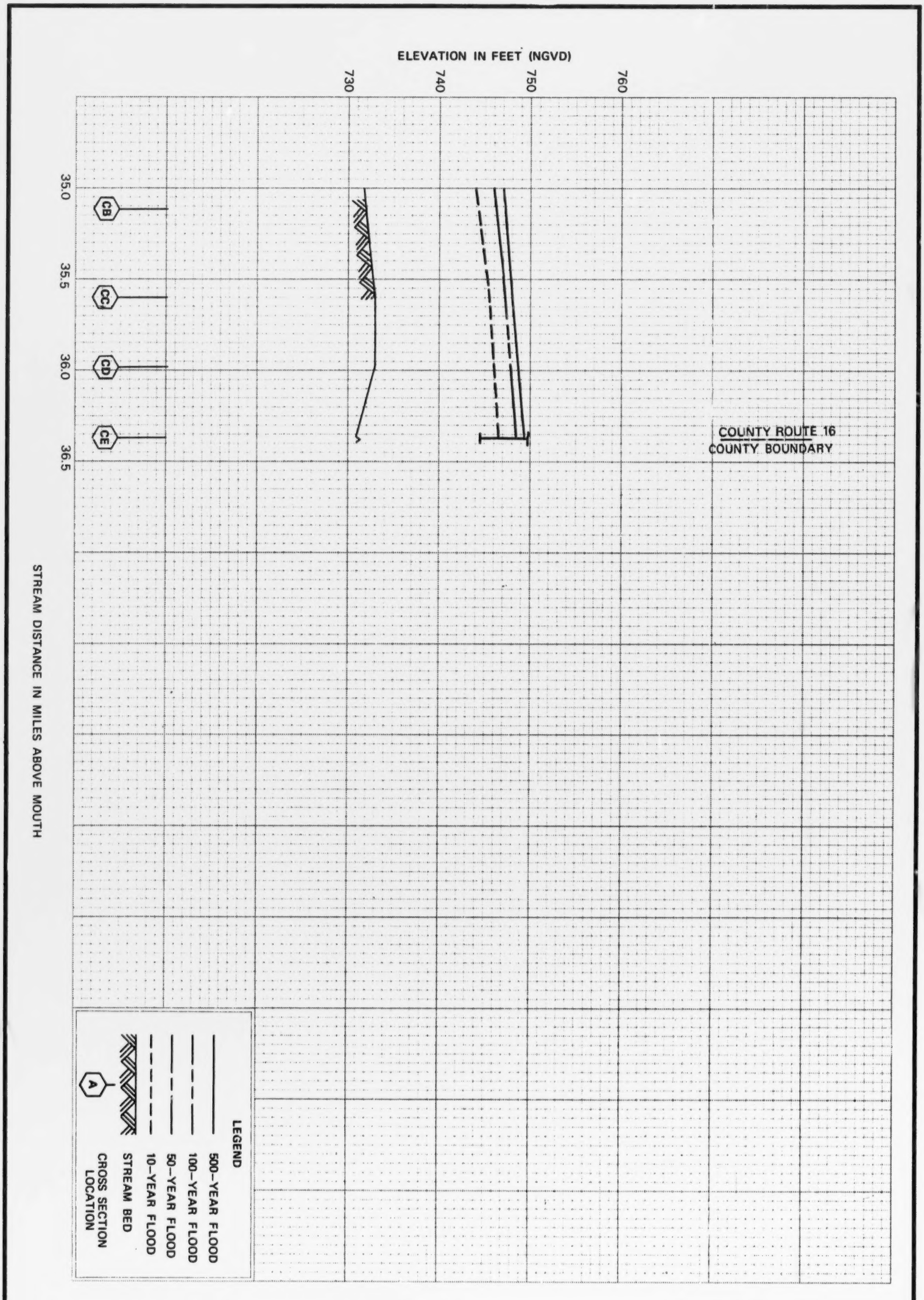
06P

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

BLANCHARD RIVER



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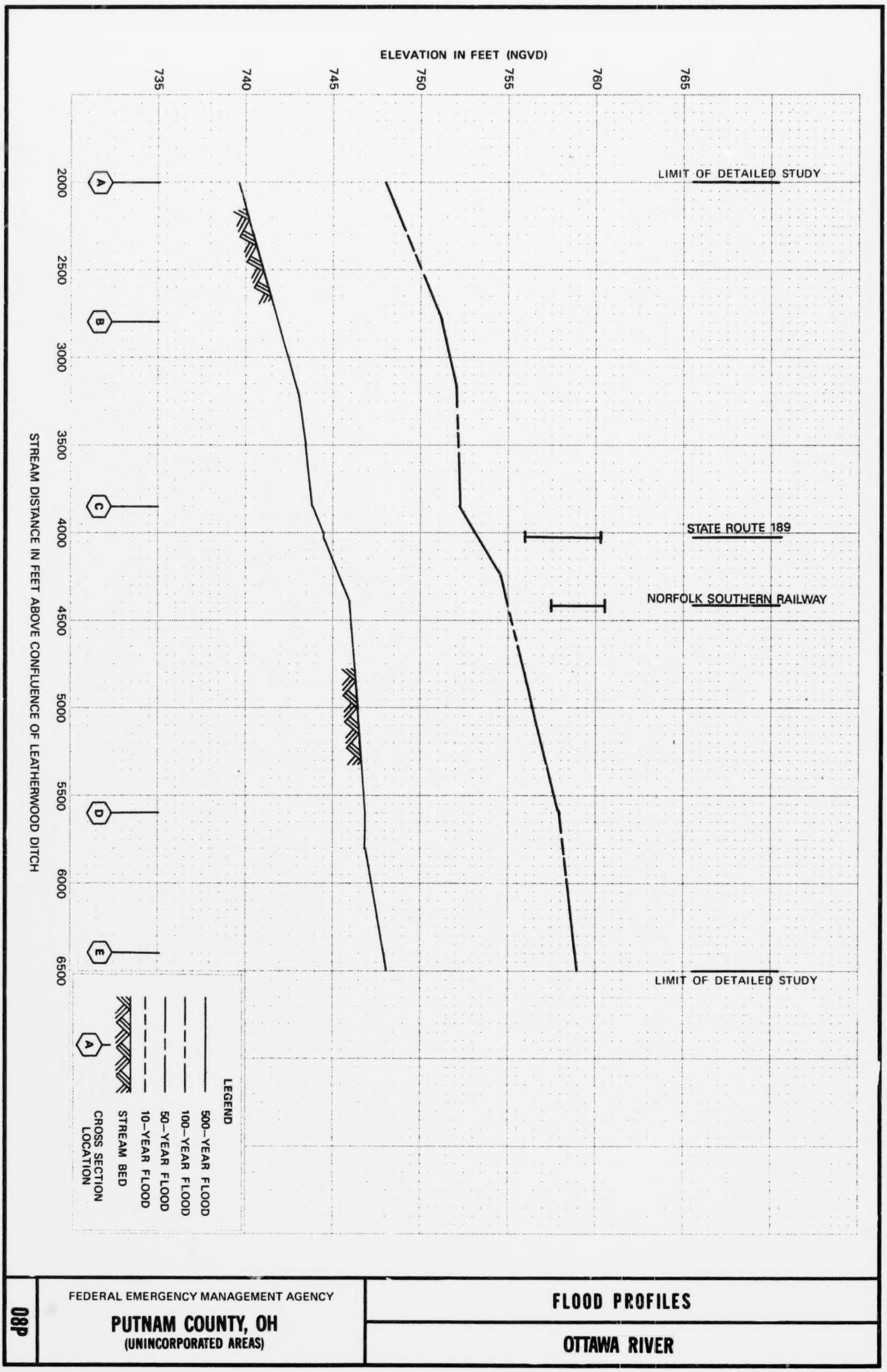

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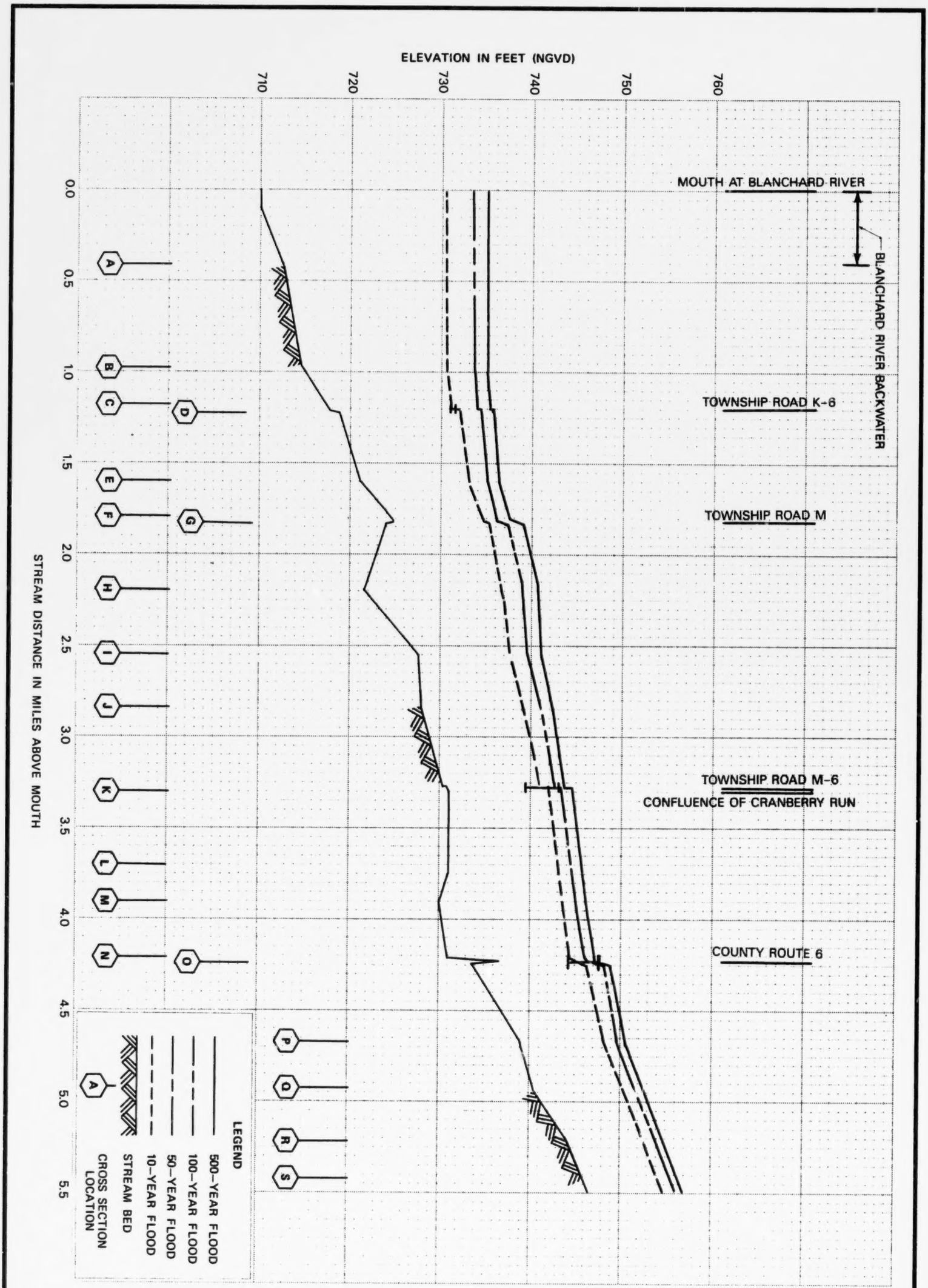


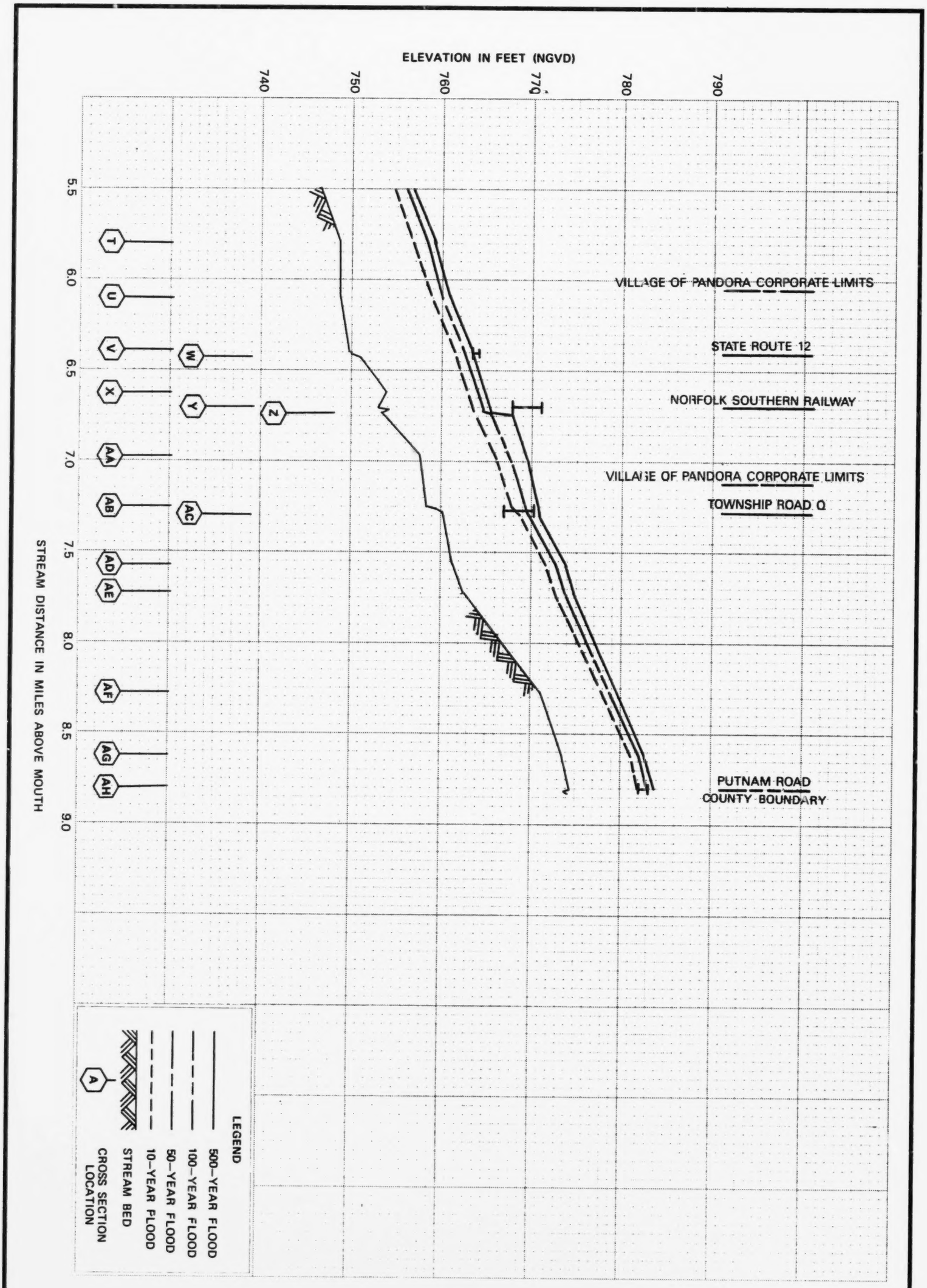
09P

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

RILEY CREEK



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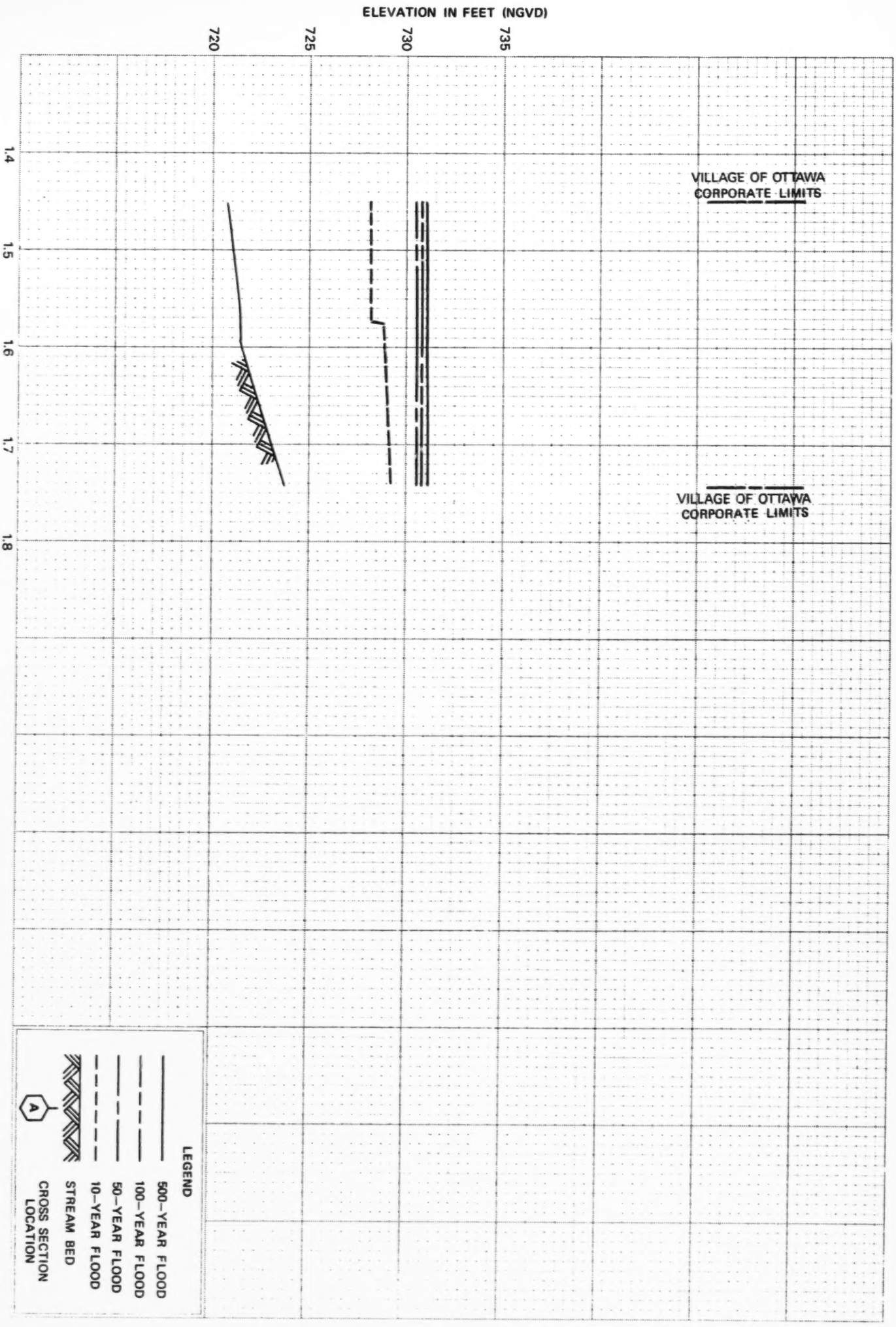
FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

RILEY CREEK



11P	FEDERAL EMERGENCY MANAGEMENT AGENCY **PUTNAM COUNTY, OH** **(UNINCORPORATED AREAS)**	**FLOOD PROFILES** **TAWA RUN**